The first 25 years of R.A.N. Airborne Radar

July 1947 saw the commencement of the R.A.N's carrier borne Fleet Air Arm and the introduction of the light fleet carrier HMAS *Sydney*. *Sydney*, in common with other carriers of the time, did not have an angle deck. The piston engined aircraft provided were Hawker Siddley **Sea Fury**, an attack aircraft and **Fairey Firefly**, a fighter bomber, both being acquired from Britain. The **Sea Fury** had no radar. The **Firefly** was equipped with the AN/APS-IV (Ash bomb) radar. The Transmitter receiver unit was assembled in a pressurised container, and housed in a nacelle which was suspended beneath the aircraft's starboard mainplane (wing). **Firefly** aircrew were Pilot and Observer, the latter sitting in his own cockpit astern of the pilot. Here the Observer had access to the Ash bomb's control panel, and a modified 'A' scan display.

Operating frequency of the Ash Bomb was a nominal 10,000 MHz using a cavity magnetron [1]. The intermediate frequency was 60 MHz, achieved using a klystron local oscillator. Maximum range was 100 nautical miles (NM) at an altitude of 10,000 feet. The antenna dish oscillated 40 degrees to port and starboard from the aircraft's heading at the rate of 1 sweep every 1.5 seconds. Pulse width was 0.6 microseconds. PRF was 1,000 for low ranges and 600 for the 100 mile range. Ash Bomb could also be used with radar beacons.The majority of the circuitry used thermionic valves, (transitor technology at that time was still in its experimental phase). With frequent heavy deck landings, equipment failure due to shattered thermionic valves was common. **Fireflies** and **Furie**s were phased out of service in 1955.

In 1955 the R.A.N. acquired H.M.A.S. *Melbourne*, another light fleet carrier, but constructed with an angle deck, suitable for jet aircraft landings. The aircraft supplied were the **De Haviland FAW Sea Venom Mk 53** fighter and the **Fairey Gannet AS1**. **Sea Venom's** radar was a 10 centimetre (3,000 MHz) air intercept AI 17, (ARI 5807)[2]. This fighter intercept aircraft carried a crew of two, with the Observer and Pilot seated side by side in the one cockpit. The Observer had control of the radar and directed the pilot during attack on a target. The transmitter, receiver and sector sweep dish antenna were mounted in the nose of the aircraft. The Design Authority for AI 17 was the Royal Radar Establishment at Malvern, Worcestershire, England.[3] The **Sea Venom** was discontinied in 1969 (4)

The **Gannet's** role was anti submarine surveillance. This was made possible by the installation of the search radar, AS Mk 19B. Mounted inside the aircraft's fuselage about midships was a radome assembly comprising the transmitter, receiver and antenna. Radar control was effected by the Observer seated in his own cockpit immediately astern of the pilot, or by the Crewman, seated in his own cockpit immediately astern of the Observer. For airborne operation, the Observer or Crewman would cause a fuselage panel located immediately beneath the radome to open up, and for the whole radome to be lowered clear of the fuselage by about 120 centimetres. Antenna continuous rotation through unobstructed 360 degrees, or sector sweep could then be controlled by the Observer or Crewman. Both Observer and Crewman had PPI display units. Mk 19B was a 3 centimetre device, transmission being achieved via a power klystron.

As well as having search radar capability, **Gannets** were equipped to operate submarine detecting sonobuoys. The **Gannet** was discontinued in 1969.

The **Grumann S2E & S2G Trackers** were introduced to the FAA in 1966, and phased out in 1984 (4) as replacements for the ageing **Gannets**. **Tracker**s were fitted with AN/APS 88 and AN/APS 88A radar, a compact lightweight radar set (95 Kgm) whose major uses were Anti Submarine Warfare (ASW), weather warning and general purpose search. Sonobuoy and IFF capability were also designed into the system.(5). All information was displayed referenced to aircraft heading or to true north at the convenience of the operator. The area scanned by the antenna was selectable at full 360° scan or a variable width chosen sector from 40° to 140°. The antenna, a cut parabolic dish, could be tilted from 10° up to 15° down. Range could be selected at anything between 3 and 240 NM. Operating frequency was 9,400 to 9,500 MHz. for serial numbers 1 & 2, and was 8,500 to 9,600 MHz for serial numbers 3 through 11, with an intermediate frequency of 30 MHz. PRF varied with selected range at 2,000, 1,025 and 200 pulses per second. Similarly the pulse lengths varied at 0.35, 0.8 and 4.5 microseconds. Peak power output was 65 Kw.

Trackers were also fitted with Doppler Navigation radar operating at 13 GHz delivering peak power of 20 Kw.

Twenty **McDonnell Skyhawk A4G** (pilot only) and **TA4G** (pilot & observer) were introduced to the R.A.N. commencing 1967, and being phased out in 1984.(4) These were carrier borne light attack fighter bombers. **Skyhawk** was fitted with APG-53A radar (6) which provided the pilot with search or mapping capabilities for navigational purposes, two modes of terrain clearance for obstacle avoidance in either azimuth or elevation plane, and air to ground slant range for weapons delivery. Automatic fire control was not provided. The scanner was a fixed plane phased array. Operating frequency was 9 GHz. Peak power outout was 20 Kw.

In 1962-63 the R.A.N. took delivery of 27 **Westland Wessex 31A** helicopters. The roles of this aircraft were anti submarine, and search and rescue. For these roles this helicopter carried a crew of 4 and was fitted with ..... (?)

The **Westland Wessex 31A** was discontinued in 1989.

Also in 1963, the R.A.N. took delivery of 2 **Westland Scout AH-1** survey helicopters which carried a crew of 2 and were fited with .....(?)

The **Westland Scout AH-1** was discontinued in 1977.

As well as the **Westland Wessex 31A**, the R.A,N. took delivery of 7 **Iroquois UH-1B** helicopters during 1964-66, for search and rescue, and for aircrew training. This helicopter carried a crew of 2 and was fitted with .....(?)

The **Iroquois UH-1B** was withdrawn from service in 1987

In 1970-71, 10 **Macchi MB326H** jet trainers came into service. These carried a crew of 2 and were fitted with .....(?).

The **Macchi MB326H** was withdrawn from service in 1983.

During this period 1947 through 1972, the R.A.N. had non-operational aircraft for specific functions such a transport & training. Sea Otter, Tiger Moth, Wirraway, Sycamore helicopter & Auster were not fitted with radar. One of the 3 **Dakotas** was fitted out as an Observer's airborne training platform with a Sea Venom AI 17 in the nose and a Gannet Mk 19B in the fuselage. **Vampires** had ……(?)

End Notes:
1. Air Publication AP2276(A) vol. 1 Sect. 4 Sheet 18.
2. Air Publication AP4360C Vol.1 Sect. 6 Chap.2
3. AI 17 Radar System, Trials & Tribulations , J.S.Saywell
4. FAA of Australia
5. Handbook Operating Instructions AN/APS-88 NAVAIR 16-30APS88-1
6. U.S. Chief of Naval Operations NAVAIR 01-40AVC-1

1301